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with 10 dm³ of liquid propylene and 2.5 standard 1 of hydrogen gas. 10 cm³ of triisobutylaluminum (20% in hydrocarbon, 10 mmol) were then added to the reactor and the mixture was stirred at 30° C. for 15 minutes. The catalyst suspension was subsequently added to the reactor, heated to the polymerization temperature of 70° C. (4° C./min) and the polymerization system was kept at 70° C. for 1 hour by cooling. The polymerization gave 3200 g of isotactic polypropylene powder.

The catalyst activity was 320 kg of PP/(g of metallocenex h).

VN=164 cm³/g, mp.=147° C., MFI_(230/2.16)=25 dg/min.

EXAMPLE 22

The preparation of the catalyst suspension of Example 10 was repeated, except that 2 mg (3.1 μmol) of rac-dimethylsilanediylbis(2-ethyl-4-phenyl-1-indenyl) zirconium(4-butadiene) dissolved in 5 cm³ of toluene were reacted with 1.7 mg (3.3 μmol) of B(C₆F₅)₃ dissolved in 5 cm³ of toluene. The polymerization gave 2150 g of isotactic polypropylene powder.

The catalyst activity was 1075 kg of PP/(g of metallocenexh).

VN=656 cm³/g, mp.=162° C., MFI_(230/5)=0.8 dg/min, M_w=957,000 g/mol, M_w/M_n=3.0.

EXAMPLE 23

The preparation of the catalyst suspension of Example 10 was repeated, except that 2 mg (2.8 μmol) of rac-dimethylsilanediylbis(2-methyl-4-naphthyl-1-indenyl) zirconium(4-butadiene) dissolved in 5 cm³ of toluene were reacted with 1.4 mg (2.8 μmol) of B(C₆F₅)₃ dissolved in 5 cm³ of toluene. The polymerization gave 2500 g of isotactic polypropylene powder.

The catalyst activity was 1250 kg of PP/(g of metallocenexh).

VN=777 cm³/g, mp.=163° C., MFI_(230/5)=0.5 dg/min, M_w=1,200,000 g/mol, M_w/M_n=3.2.

EXAMPLE 24

10 g of silica gel (Davison 948), which had been conditioned at 800° C., were admixed with 0.5 g of B(C₆F₅)₃ dissolved in 15 cm³ of toluene and homogenized. The solvent was taken off in vacuo. This resulted in a free-flowing powder. 200 mg of rac-dimethylsilanediylbis(2-methyl-1-indenyl)zirconium(4-butadiene) (435 μmol) were dissolved in 15 cm³ of toluene and applied in small portions to the intensively stirred, free-flowing powder. The powder acquires an intense dark red color. The toluene was subsequently taken off in vacuo. This resulted in 11.3 g of supported catalyst as free-flowing powder. 1.5 g of the supported catalyst were suspended in 10 ml of hexane and introduced into the polymerization reactor. The polymerization was carried out by a method similar to Example A at 70° C. The excess monomer was drawn off and the polymer powder was dried in vacuo. This gave 2350 g of isotactic polypropylene powder having a bulk density of 0.44 g/ml and a mean particle size of the polymer particles of 650 μm. Analysis of the polymer gave VN=172 cm³/g, mp.=145° C., M_w=192,000 g/mol, M_w/M_n=2.2, MFI_(230/2.16)=13 dg/min.

EXAMPLE 25

Comparative Example

The preparation of the catalyst suspension of Example 10 was repeated, except that 5 mg (11.1 μmol) of rac-

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dimethylsilanediylbis-1-indenylzirconium(η⁴-butadiene) dissolved in 10 cm³ of toluene were reacted with 5.7 mg (11.1 μmol) of B(C₆F₅)₃ dissolved in 10 cm³ of toluene. The polymerization resulted in 2200 g of isotactic polypropylene powder.

The catalyst activity was 440 kg of PP/(g of metallocenex h).

VN=52 cm³/g, mp.=140° C., M_w=49,000 g/mol, M_w/M_n=2.2.

16.6 mg (40.7 μmol) of rac-dimethylsilanediylbis-1-indenylzirconiumdimethyl were dissolved in 10 cm³ of toluene and reacted with 21 mg (41 μmol) of B(C₆F₅)₃ dissolved in 10 cm³ of toluene. No turbidity or precipitate formation can be observed. The catalyst solution is used for the polymerization as in Example 9. This resulted in 130 g of isotactic polypropylene powder.

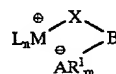
The catalyst activity was 8 kg of PP/(g of metallocenex h).

VN=67 cm³/g, mp.=139.5° C., M_w=62,000 g/mol, M_w/M_n=2.1.

We claim:

1. A zwitterionic transition metal compound of the formula I

(I)



where

L are identical or different and are each a π-ligand or an electron donor, n is equal to 1, 2, 3 or 4,

M is a metal atom of group IIb, IVb, Vb or VIb of the Periodic Table of the Elements,

X is a heteroatom or a hydrocarbon group having 1-40 carbon atoms,

X' is a hydrocarbon group having 1-40 carbon atoms,

A is an atom of group Ib, IIb, IIIa, IIIb, IVa, Va, Vb, VIb, VIIb or VIIIb of the Periodic Table of the Elements,

R¹ are identical or different and are each a perhalogenated C₁-C₄₀-hydrocarbon radical, and m is equal to 1, 2, 3, 4 or 5.

2. A transition metal compound as claimed in claim 1, wherein the radicals L are identical or different and are each a π-ligand.

3. A transition metal compound as claimed in claim 1, wherein the radicals L are identical or different and are each an unsubstituted or substituted cyclopentadienyl group.

4. A transition metal compound as claimed in claim 1, wherein the radicals L are linked to one another via a bridge.

5. A transition metal compound as claimed in claim 1, wherein n=2 when M is a metal atom of group IVb of the Periodic Table of the Elements.

6. A transition metal compound as claimed in claim 1, wherein

M is a metal atom of group IVb of the Periodic Table of the Elements, n is equal to 2,

L are identical or different and are each a substituted or unsubstituted cyclopentadienyl group, where two radicals L are optionally linked to one another via a bridge Z and

Z is CR²R³ or SiR²R³ or a unit Si-(CR²R³)_x-Si which links two fragments L_nM⁺XX'-A-R¹_m with one another, where x is an integer from 0 to 10,

X and X' together form a three-membered to five-membered hydrocarbon chain which can be saturated or unsaturated and are unsubstituted or substituted by one or more C₁-C₂₀-hydrocarbon radicals,

R² and R³ are identical or different and are each a hydrogen atom, a halogen atom, a C₁-C₂₀-alkyl group, a C₁-C₁₀-fluoralkyl group, a C₁-C₁₀-alkoxy group, a C₆-C₁₄-aryl group, a C₆-C₁₀-fluoroaryl group, a C₆-C₁₀-aryloxy group, a C₂-C₁₀-alkenyl group, a C₇-C₄₀-arylalkyl group, a C₇-C₄₀-alkylaryl group, a C₈-C₄₀-arylalkenyl group, or R² and R³ together with the atoms connected them form one or more rings, and R² and R³ are optionally bonded to L;

A is an atom of group Ib, IIb, IIIa, IVa, Va, Vb of the Periodic Table of the Elements,

R¹ are identical or different and are each a perfluorinated alkyl or aryl group having from 1 to 20 carbon atoms and

m is equal to 2, 3 or 4.

7. A transition metal compound as claimed in claim 6, wherein

M is zirconium,

n is equal to 2,

L are identical or different and are each a substituted cyclopentadienyl group, where two radicals L are linked to one another via a bridge Z, where Z is CR²R³ or SiR²R³ and R² and R³ are as defined in claim 6,

X and X' together form an unsaturated four-membered hydrocarbon chain whose hydrogen atoms are optionally replaced by C₁-C₂₀-alkyl groups,

A is boron atom,

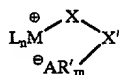
R¹ are identical and are each a pentafluorophenyl group (C₆F₅) and

m is equal to 3.

8. A catalyst component comprising at least one transition metal compound as claimed in claim 1.

9. A catalyst component as claimed in claim 8, additionally containing a support.

10. A process for preparing a compound according to claim 1 of the formula I,



where

L are identical or different and are each a π ligand or an electron donor, n is equal to 1, 2, 3 or 4,

M is a metal atom of group IIIb, IVb, Vb or VIb of the Periodic Table of the Elements,

X is a heteroatom or a hydrocarbon group having 1-40 carbon atoms,

X' is a hydrocarbon group having 1-40 carbon atoms,

A is an atom of group Ib, IIb, IIIa, IIIb, IVa, Va, Vb, VIb, VIIb or VIIIb of the Periodic Table of the Elements,

R¹ are identical or different and are each a perhalogenated C₁-C₄₀-hydrocarbon radical, and m is equal to 1, 2, 3, 4 or 5, which comprises reacting a compound of the formula II

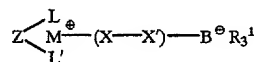


with a compound of the formula III



and reacting the reaction product with a compound of the formula AR¹_m, where L, n, M, X, B, A, R¹ and m in the formulae II, III and AR¹_m are as defined for the formula I and Hal is a halogen atom.

11. A zwitterionic transition metal compound of the formula



25 wherein:

L and L' are identical or different and are each a substituted or unsubstituted cyclopentadienyl group;

Z is a bridge linking together said L and L' and is a group of the formula CR²R³ or SiR²R³;

R² and R³ are identical or different and are each a hydrogen atom, a halogen atom, a C₁-C₂₀-alkyl group, a C₁-C₁₀-fluoralkyl group, a C₁-C₁₀-alkoxy group, a C₆-C₁₄-aryl group, a C₆-C₁₀-fluoroaryl group, a C₆-C₁₀-aryloxy group, a C₂-C₁₀-alkenyl group, a C₇-C₄₀-arylalkyl group, a C₇-C₄₀-alkylaryl group, a C₈-C₄₀-arylalkenyl group, or R² and R³ together with the atoms connected them form one or more rings, and R² and R³ are optionally bonded to L;

M is a metal atom of group IVb of the Periodic Table of the Elements;

X-X' is a 3- to 5-membered saturated or unsaturated hydrocarbon chain which is unsubstituted or substituted by one or more C₁-C₂₀-hydrocarbon radicals; and the R¹ radicals are identical or different and are each a perfluorinated alkyl or aryl group having from 1 to 20 carbon atoms.

12. A catalyst system for olefin polymerization comprising a transition metal compound of claim 11 and, optionally, a catalyst support material.

13. A catalyst system as claimed in claim 12, wherein said catalyst system is essentially free of an aluminosilicate except when said catalyst support material is present and is a solid aluminosilicate.

14. The catalyst as claimed in claim 8, wherein M is titanium, zirconium or hafnium.

15. The catalyst as claimed in claim 12, wherein M is zirconium.

16. The catalyst as claimed in claim 14, wherein an unsubstituted or

M is Zr,

n is equal to 2,

L are identical or different and are each a substituted cyclopentadienyl group, where two radicals L are linked to one another via a bridge Z, and

Z is CR²R³ or SiR²R³ or a unit Si-(CR²R³)_x-Si which links two fragments L_nM⁺XX'A-R¹_m with one another, where x is an integer from 0 to 10,

X and X' together form a three-membered to five-membered (C₃-C₅)-alkyl chain which is saturated or unsaturated and optionally substituted by C₁-C₂₀-hydrocarbon radicals,

A is a metal of group Ib, IIb, IIIb, IVa, Vb, of the Periodic Table of the Elements,

R¹ are identical or different and are each a pentafluorinated alkyl or aryl group having from 1 to 20 carbon atoms,

R² and R³ are identical or different and are each a hydrogen atom, a halogen atom, a C₁-C₂₀-alkyl group, a C₁-C₁₀-fluoroalkyl group, a C₁-C₁₀-alkoxy group, a C₆-C₁₄-aryl group, a C₆-C₁₀-fluoroaryl group, a C₆-C₁₀-aryloxy group, a C₂-C₁₀-alkenyl group, a C₇-C₄₀-arylalkyl group, a C₇-C₄₀-alkylaryl group, a C₈-C₄₀-arylalkenyl group and

m is equal to 3.

17. The catalyst as claimed in claim 8, wherein

M is zirconium,

n is equal to 2,

L are identical or different and are each a substituted cyclopentadienyl group, where two radicals L are bonded to one another via a bridge Z, where Z is CR²R³ or SiR²R³,

X and X' together form an unsaturated four-membered (C₄)-alkyl chain whose hydrogen atoms can also be replaced by C₁-C₂₀-alkyl groups,

A is a boron atom,

R¹ are identical and are each a pentafluorophenyl group (C₆F₅),

R² and R³ are identical or different and are each a hydrogen atom, a halogen atom, a C₁-C₂₀-alkyl group, a C₁-C₁₀-fluoroalkyl group, a C₁-C₁₀-alkoxy group, a C₆-C₁₄-aryl group, a C₆-C₁₀-fluoroaryl group, a C₆-C₁₀-aryloxy group, a C₂-C₁₀-alkenyl group, a C₇-C₄₀-arylalkyl group, a C₇-C₄₀-alkylaryl group, a C₈-C₄₀-arylalkenyl group and m is equal to 3.

18. The compound as claimed in claim 1, wherein the transition metal compound of the formula I is selected from the group consisting of

bis(cyclopentadienyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
bis(methylcyclopentadienyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
bis(n-butylcyclopentadienyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
bisindenylZr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
(tert-butylamido)dimethyl(tetramethyl-η⁵-cyclopentadienyl)silaneZr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
bis(2-methylbenzoidindenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
dimethylsilanediylbis(2-methylindenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
dimethylsilanediylbisindenylZr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
dimethylsilanediylbis(2-methylbenzoidindenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
dimethylsilanediyl(2-methylbenzoidindenyl)(2-methylindenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
dimethylsilanediyl(2-methylbenzoidindenyl)(2-methyl-4-phenylindenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
dimethylsilanediyl(2-methylindenyl)(4-phenylindenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
dimethylsilanediylbis(2-methyl-4-phenylindenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
dimethylsilanediylbis(2-methyl-4,6-diisopropylindenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
dimethylsilanediylbis(2-methyl-4-naphthylindenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
isopropylidene(cyclopentadienyl)(fluorenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;

isopropylidene(cyclopentadienyl)(indenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
[4-η⁵-cyclopentadienyl-4,7,7-trimethyl-(η⁵-4,5,6,7-tetrahydroindenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
dimethylsilanediylbis(2-methylindenyl)Zr⁺OCH₂CH₂CH₂B⁻(C₆F₅)₃;
dimethylsilanediylbisindenylZr⁺OCH₂CH₂CH₂B⁻(C₆F₅)₃;
dimethylsilanediylbis(2-methylbenzoidindenyl)Zr⁺OCH₂CH₂CH₂B⁻(C₆F₅)₃;
dimethylsilanediyl(2-methylbenzoidindenyl)(2-methylindenyl)Zr⁺OCH₂CH₂CH₂B⁻(C₆F₅)₃;
dimethylsilanediyl(2-methylbenzoidindenyl)(2-methyl-4-phenylindenyl)Zr⁺OCH₂CH₂CH₂B⁻(C₆F₅)₃;
dimethylsilanediyl(2-methylindenyl)(4-phenylindenyl)Zr⁺OCH₂CH₂CH₂B⁻(C₆F₅)₃;
dimethylsilanediylbis(2-methyl-4-phenylindenyl)Zr⁺OCH₂CH₂CH₂B⁻(C₆F₅)₃;
dimethylsilanediylbis(2-methyl-4,6-diisopropylindenyl)Zr⁺OCH₂CH₂CH₂B⁻(C₆F₅)₃;
dimethylsilanediylbis(2-methylindenyl)Zr⁺CH₂CHCHCH₂B⁻(CF₃)₃;
dimethylsilanediylbisindenylZr⁺CH₂CHCHCH₂B⁻(CF₃)₃;
dimethylsilanediylbis(2-methylbenzoidindenyl)Zr⁺CH₂CHCHCH₂B⁻(CF₃)₃;
dimethylsilanediyl(2-methylbenzoidindenyl)(2-methylindenyl)Zr⁺CH₂CHCHCH₂B⁻(CF₃)₃;
dimethylsilanediyl(2-methylbenzoidindenyl)(2-methyl-4-phenylindenyl)Zr⁺CH₂CHCHCH₂B⁻(CF₃)₃;
dimethylsilanediyl(2-methylindenyl)(4-phenylindenyl)Zr⁺CH₂CHCHCH₂B⁻(CF₃)₃;
dimethylsilanediylbis(2-methyl-4-phenylindenyl)Zr⁺CH₂CHCHCH₂B⁻(CF₃)₃;
dimethylsilanediylbis(2-methyl-4,6-diisopropylindenyl)Zr⁺CH₂CHCHCH₂B⁻(CF₃)₃;
dimethylsilanediylbis(2-methyl-4-naphthylindenyl)Zr⁺CH₂CHCHCH₂B⁻(CF₃)₃;
dimethylsilanediylbis(2-methylindenyl)Zr⁺CH₂C(CH₃)C(CH₃)CH₂B⁻(CF₃)₃;
dimethylsilanediylbisindenylZr⁺CH₂C(CH₃)C(CH₃)CH₂B⁻(CF₃)₃;
dimethylsilanediylbis(2-methylbenzoidindenyl)Zr⁺CH₂C(CH₃)C(CH₃)CH₂B⁻(CF₃)₃;
dimethylsilanediyl(2-methylbenzoidindenyl)(2-methylindenyl)Zr⁺CH₂C(CH₃)C(CH₃)CH₂B⁻(CF₃)₃;
dimethylsilanediyl(2-methylbenzoidindenyl)(2-methyl-4-phenylindenyl)Zr⁺CH₂C(CH₃)C(CH₃)CH₂B⁻(CF₃)₃;
dimethylsilanediyl(2-methylindenyl)(4-phenylindenyl)Zr⁺CH₂C(CH₃)C(CH₃)CH₂B⁻(CF₃)₃;
dimethylsilanediylbis(2-methyl-4-phenylindenyl)Zr⁺CH₂C(CH₃)C(CH₃)CH₂B⁻(CF₃)₃;
dimethylsilanediylbis(2-methyl-4,6-diisopropylindenyl)Zr⁺CH₂C(CH₃)C(CH₃)CH₂B⁻(CF₃)₃;
dimethylsilanediylbis(2-methyl-4-naphthylindenyl)Zr⁺CH₂C(CH₃)C(CH₃)CH₂B⁻(CF₃)₃;
methylphenylmethylenefluorenyl(cyclopentadienyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
diphenylmethylenefluorenyl(cyclopentadienyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
isopropylidene(3-methylcyclopentadienyl)(fluorenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
dimethylsilanediyl(3-tert-butylcyclopentadienyl)(fluorenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
diphenylsilanediyl(3-(trimethylsilyl)cyclopentadienyl)(fluorenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
phenylmethylsilanediylbis(2-methylindenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
phenylmethylsilanediylbisindenylZr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;

phenylmethylsilanediybis(2-methyl-4,5-benzoindenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
 phenylmethylsilanediy(2-methyl-4,5-benzoindenyl)(2-methylindenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
 phenylmethylsilanediy(2-methyl-4,5-benzoindenyl)(2-methyl-4-phenylindenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
 phenylmethylsilanediy(2-methylindenyl)(4-phenylindenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
 phenylmethylsilanediybis(2-methyl-4-phenylindenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
 phenylmethylsilanediybis(2-ethyl-4-phenylindenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
 phenylmethylsilanediybis(2-methyl-4,6-diisopropylindenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
 phenylmethylsilanediybis(2-methyl-4-naphthylindenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
 ethylenebis(2-methylindenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
 ethylenebisindenylZr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
 ethylenebis(2-methyl-4,5-benzoindenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
 ethylene(2-methyl-4,5-benzoindenyl)(2-methylindenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
 ethylene(2-methyl-4,5-benzoindenyl)(2-methyl-4-phenylindenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
 ethylene(2-methylindenyl)(4-phenylindenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
 ethylenebis(2-methyl-4,5-benzoindenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
 ethylenebis(2-methyl-4-phenylindenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
 ethylenebis(2-methyl-4,6-diisopropylindenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
 ethylenebis(2-methyl-4-naphthylindenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
 ethylenebis(2-ethyl-4-phenylindenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
 ethylenebis(2-ethyl-4,6-diisopropylindenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
 ethylenebis(2-ethyl-4-naphthylindenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
 dimethylsilanediybis(2-ethyl-4-phenylindenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
 dimethylsilanediybis(2,3,5-trimethylcyclopentadienyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
 1,6-{bis[methylsilyl]bis(2-methyl-4-phenylindenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃}}hexane;
 1,6-{bis[methylsilyl]bis(2-ethyl-4-phenylindenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃}}hexane;
 1,6-{bis[methylsilyl]bis(2-methyl-4-naphthylindenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃}}hexane;
 1,6-{bis[methylsilyl]bis(2-methyl-4,5-benzoindenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃}}hexane;
 1,6-{bis[methylsilyl](2-methyl-4-phenylindenyl)(2-methylindenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃}}hexane;
 1,2-{bis[methylsilyl]bis(2-methyl-4-phenylindenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃}}ethane;
 1,2-{bis[methylsilyl]bis(2-ethyl-4-phenylindenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃}}ethane;
 1,2-{bis[methylsilyl]bis(2-methyl-4-naphthylindenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃}}ethane;
 1,2-{bis[methylsilyl]bis(2-methyl-4,5-benzoindenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃}}ethane; and
 1,2-{bis[methylsilyl](2-methyl-4-phenylindenyl)(2-methylindenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃}}ethane.

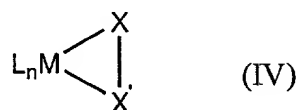
19. The catalyst as claimed in claim 8, wherein the transition metal compound of the formula I is selected from the group consisting of

bis(cyclopentadienyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
 bis(methylcyclopentadienyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
 bis(n-butylcyclopentadienyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
 bisindenylZr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
 (tert-butylamido)dimethyl(tetramethyl-η⁵-cyclopentadienyl)silaneZr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
 bis(2-methylbenzoindenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
 dimethylsilanediybis(2-methylindenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
 dimethylsilanediybisindenylZr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
 dimethylsilanediybis(2-methylbenzoindenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
 dimethylsilanediy(2-methylbenzoindenyl)(2-methylindenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
 dimethylsilanediy(2-methylbenzoindenyl)(2-methyl-4-phenylindenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
 dimethylsilanediy(2-methylindenyl)(4-phenylindenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
 dimethylsilanediybis(2-methyl-4-phenylindenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
 dimethylsilanediybis(2-methyl-4,6-diisopropylindenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
 dimethylsilanediybis(2-methylbenzoindenyl)Zr⁺CH₂CHCHCH₂B⁻(CF₃)₃;
 dimethylsilanediy(2-methylbenzoindenyl)(2-methylindenyl)Zr⁺CH₂CHCHCH₂B⁻(CF₃)₃;
 dimethylsilanediy(2-methylbenzoindenyl)(2-methyl-4-phenylindenyl)Zr⁺CH₂CHCHCH₂B⁻(CF₃)₃;
 dimethylsilanediy(2-methylindenyl)(4-phenylindenyl)Zr⁺CH₂CHCHCH₂B⁻(CF₃)₃;
 dimethylsilanediybis(2-methyl-4-phenylindenyl)Zr⁺CH₂CHCHCH₂B⁻(CF₃)₃;
 dimethylsilanediybis(2-methyl-4,6-diisopropylindenyl)Zr⁺CH₂CHCHCH₂B⁻(CF₃)₃;
 dimethylsilanediybis(2-methyl-4-naphthylindenyl)Zr⁺CH₂CHCHCH₂B⁻(CF₃)₃;
 dimethylsilanediybis(2-methylindenyl)Zr⁺CH₂C(CH₃)C(CH₃)CH₂B⁻(CF₃)₃;
 dimethylsilanediybisindenylZr⁺CH₂C(CH₃)C(CH₃)CH₂B⁻(CF₃)₃;
 dimethylsilanediybis(2-methylbenzoindenyl)Zr⁺CH₂C(CH₃)C(CH₃)CH₂B⁻(CF₃)₃;
 dimethylsilanediy(2-methylbenzoindenyl)(2-methylindenyl)Zr⁺CH₂C(CH₃)C(CH₃)CH₂B⁻(CF₃)₃;
 dimethylsilanediy(2-methylbenzoindenyl)(2-methyl-4-phenylindenyl)Zr⁺CH₂C(CH₃)C(CH₃)CH₂B⁻(CF₃)₃;
 dimethylsilanediy(2-methylindenyl)(4-phenylindenyl)Zr⁺CH₂C(CH₃)C(CH₃)CH₂B⁻(CF₃)₃;
 dimethylsilanediybis(2-methyl-4-naphthylindenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
 isopropylidene(cyclopentadienyl)(fluorenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
 isopropylidene(cyclopentadienyl)(indenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
 [4-η²-cyclopentadienyl-4,7,7-trimethyl-(η⁵-4,5,6,7-tetrahydroindenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
 dimethylsilanediybis(2-methylindenyl)Zr⁺OCH₂CH₂CH₂B⁻(C₆F₅)₃;
 dimethylsilanediybisindenylZr⁺OCH₂CH₂CH₂B⁻(C₆F₅)₃;
 dimethylsilanediybis(2-methylbenzoindenyl)Zr⁺OCH₂CH₂CH₂B⁻(C₆F₅)₃;
 dimethylsilanediy(2-methylbenzoindenyl)(2-methylindenyl)Zr⁺OCH₂CH₂CH₂B⁻(C₆F₅)₃;
 dimethylsilanediy(2-methylbenzoindenyl)(2-methyl-4-phenylindenyl)Zr⁺OCH₂CH₂CH₂B⁻(C₆F₅)₃;
 dimethylsilanediy(2-methylindenyl)(4-phenylindenyl)Zr⁺OCH₂CH₂CH₂B⁻(C₆F₅)₃;

dimethylsilanediybis(2-methyl-4-phenylindenyl)Zr⁺
 OCH₂CH₂CH₂B⁻(C₆F₅)₃;
 dimethylsilanediybis(2-methyl-4,6-diisopropylindenyl)Zr⁺
 OCH₂CH₂CH₂B⁻(C₆F₅)₃;
 dimethylsilanediybis(2-methylindenyl)Zr⁺
 CH₂CHCHCH₂B⁻(C₆F₅)₃;
 dimethylsilanediybisindenylZr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
 dimethylsilanediybis(2-methyl-4-phenylindenyl)Zr⁺CH₂C
 (CH₃)C(CH₃)CH₂B⁻(C₆F₅)₃;
 dimethylsilanediybis(2-methyl-4,6-diisopropylindenyl)Zr⁺
 CH₂C(CH₃)C(CH₃)CH₂B⁻(C₆F₅)₃;
 dimethylsilanediybis(2-methyl-4-naphthylindenyl)Zr⁺
 CH₂C(CH₃)C(CH₃)CH₂B⁻(C₆F₅)₃;
 methylphenylmethylenefluorenyl(cyclopentadienyl)Zr⁺
 CH₂CHCHCH₂B⁻(C₆F₅)₃;
 diphenylmethylenefluorenyl(cyclopentadienyl)Zr⁺
 CH₂CHCHCH₂B⁻(C₆F₅)₃;
 isopropylidene(3-methylcyclopentadienyl)(fluorenyl)Zr⁺
 CH₂CHCHCH₂B⁻(C₆F₅)₃;
 dimethylsilanediybis(3-tert-butylcyclopentadienyl)(fluorenyl)
 Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
 diphenylsilanediybis(3-(trimethylsilyl)cyclopentadienyl)
 (fluorenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
 phenylmethylsilanediybis(2-methylindenyl)Zr⁺
 CH₂CHCHCH₂B⁻(C₆F₅)₃;
 phenylmethylsilanediybisindenylZr⁺CH₂CHCHCH₂B⁻
 (C₆F₅)₃;
 phenylmethylsilanediybis(2-methyl-4,5-benzoidindenyl)Zr⁺
 CH₂CHCHCH₂B⁻(C₆F₅)₃;
 phenylmethylsilanediybis(2-methyl-4,5-benzoidindenyl)(2-
 methylindenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
 phenylmethylsilanediybis(2-methyl-4,5-benzoidindenyl)(2-
 methyl-4-phenylindenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
 phenylmethylsilanediybis(2-methylindenyl)(4-phenylindenyl)
 Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
 phenylmethylsilanediybis(2-methyl-4-phenylindenyl)Zr⁺
 CH₂CHCHCH₂B⁻(C₆F₅)₃;
 phenylmethylsilanediybis(2-ethyl-4-phenylindenyl)Zr⁺
 CH₂CHCHCH₂B⁻(C₆F₅)₃;
 phenylmethylsilanediybis(2-methyl-4,6-
 diisopropylindenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
 phenylmethylsilanediybis(2-methyl-4-naphthylindenyl)Zr⁺
 CH₂CHCHCH₂B⁻(C₆F₅)₃;
 ethylenebis(2-methylindenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
 ethylenebisindenylZr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
 ethylenebis(2-methyl-4,5-benzoidindenyl)Zr⁺
 CH₂CHCHCH₂B⁻(C₆F₅)₃;
 ethylene(2-methyl-4,5-benzoidindenyl)(2-methylindenyl)Zr⁺
 CH₂CHCHCH₂B⁻(C₆F₅)₃;

ethylene(2-methyl-4,5-benzoidindenyl)(2-methyl-4-
 phenylindenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃;
 ethylene(2-methylindenyl)(4-phenylindenyl)Zr⁺
 CH₂CHCHCH₂B⁻(C₆F₅)₃;
 ethylenebis(2-methyl-4,5-benzoidindenyl)Zr⁺
 CH₂CHCHCH₂B⁻(C₆F₅)₃;
 ethylenebis(2-methyl-4-phenylindenyl)Zr⁺
 CH₂CHCHCH₂B⁻(C₆F₅)₃;
 ethylenebis(2-methyl-4,6-diisopropylindenyl)Zr⁺
 CH₂CHCHCH₂B⁻(C₆F₅)₃;
 ethylenebis(2-methyl-4-naphthylindenyl)Zr⁺
 CH₂CHCHCH₂B⁻(C₆F₅)₃;
 ethylenebis(2-ethyl-4-phenylindenyl)Zr⁺CH₂CHCHCH₂B⁻
 (C₆F₅)₃;
 ethylenebis(2-ethyl-4,6-diisopropylindenyl)Zr⁺
 CH₂CHCHCH₂B⁻(C₆F₅)₃;
 ethylenebis(2-ethyl-4-naphthylindenyl)Zr⁺
 CH₂CHCHCH₂B⁻(C₆F₅)₃;
 dimethylsilanediybis(2-ethyl-4-phenylindenyl)Zr⁺
 CH₂CHCHCH₂B⁻(C₆F₅)₃;
 dimethylsilanediybis(2,3,5-trimethylcyclopentadienyl)Zr⁺
 CH₂CHCHCH₂B⁻(C₆F₅)₃;
 1,6-{bis[methylsilylbis(2-methyl-4-phenylindenyl)Zr⁺
 CH₂CHCHCH₂B⁻(C₆F₅)₃]}hexane;
 1,6-{bis[methylsilylbis(2-ethyl-4-phenylindenyl)Zr⁺
 CH₂CHCHCH₂B⁻(C₆F₅)₃]}hexane;
 1,6-{bis[methylsilylbis(2-methyl-4-naphthylindenyl)Zr⁺
 CH₂CHCHCH₂B⁻(C₆F₅)₃]}hexane;
 1,6-{bis[methylsilylbis(2-methyl-4,5-benzoidindenyl)Zr⁺
 CH₂CHCHCH₂B⁻(C₆F₅)₃]}hexane;
 1,6-{bis[methylsilyl(2-methyl-4-phenylindenyl)(2-
 methylindenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃]}hexane;
 1,2-{bis[methylsilylbis(2-methyl-4-phenylindenyl)Zr⁺
 CH₂CHCHCH₂B⁻(C₆F₅)₃]}ethane;
 1,2-{bis[methylsilylbis(2-ethyl-4-phenylindenyl)Zr⁺
 CH₂CHCHCH₂B⁻(C₆F₅)₃]}ethane;
 1,2-{bis[methylsilylbis(2-methyl-4-naphthylindenyl)Zr⁺
 CH₂CHCHCH₂B⁻(C₆F₅)₃]}ethane;
 1,2-{bis[methylsilylbis(2-methyl-4,5-benzoidindenyl)Zr⁺
 CH₂CHCHCH₂B⁻(C₆F₅)₃]}ethane; and
 1,2-{bis[methylsilyl(2-methyl-4-phenylindenyl)(2-
 methylindenyl)Zr⁺CH₂CHCHCH₂B⁻(C₆F₅)₃]}ethane.
 20. The compound as claimed in claim 1, wherein M is
 zirconium.
 21. The compound as claimed in claim 1, wherein M is a
 metal atom group IVb of the Periodic Table of Elements.

22. A transition metal compound of the formula IV



wherein

L are identical or different and are each a substituted π ligand,

n is equal to 1, 2, 3, or 4,

M is a metal atom of group IIIb, IVb, Vb or VIb of the Periodic Table of the Elements,

X is a heteroatom or a hydrocarbon group having 1-40 carbon atoms,

X' is a hydrocarbon group having 1-40 carbon atoms.

23. The transition metal compound as claimed in claim 22, wherein the radicals L are identical or different and are each a substituted cyclopentadienyl group.

24. The transition metal compound as claimed in claim 22, wherein the radicals L are linked to one another via a bridge.

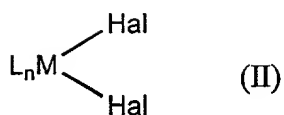
25. The transition metal compound as claimed in claim 22, wherein n is 2 when M is a metal atom of group IVb of the Periodic Table of the Elements.

26. The transition metal compound as claimed in claim 22, wherein

M is a metal atom of group IVb of the Periodic Table of the Elements, n is equal to 2,

L are identical or different and are each a substituted cyclopentadienyl group, where two radicals L are optionally linked to one another via a bridge Z and

Z is CR^2R^3 or SiR^2R^3 or a unit $\text{Si}-(\text{CR}^2\text{R}^3)_x-\text{Si}$ which links two fragments $\text{L}_n\text{MXX}'\text{A-R}_m^1$ with one another, where x is an integer from 0 to 10,

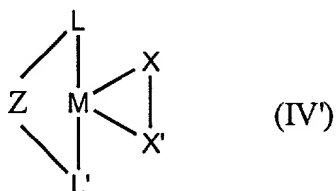


with a compound of the formula III



and reacting the reaction product with a compound of the formula AR_m^1 , where L, n, M, X and X' in the formulae II and III are defined for the formula IV and Hal is a halogen atom.

29. A transition metal compound of the formula IV'



where

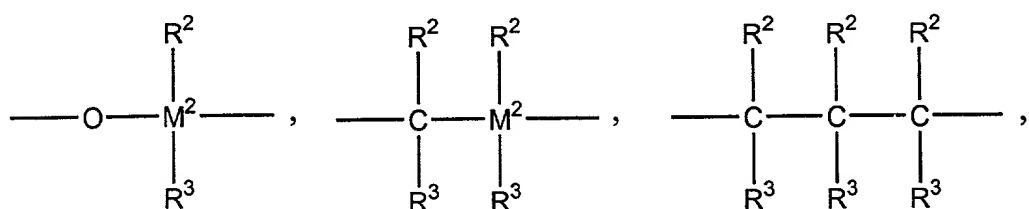
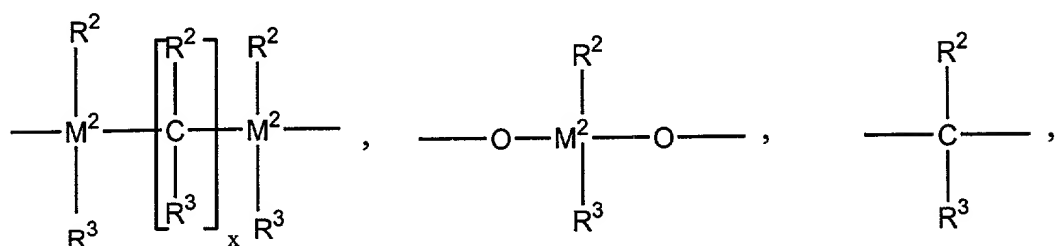
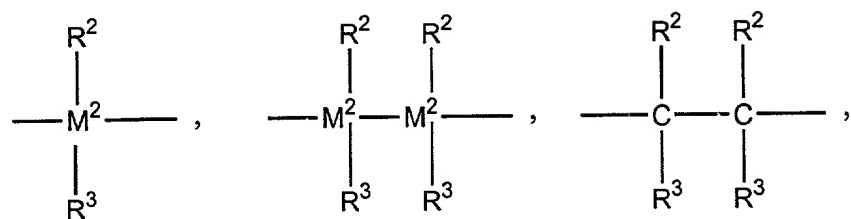
L and L' are identical or different and are each a π ligand or an electron donor.

M is a metal atom of group IIIb, IVb, Vb or VIb of the Periodic Table of the Elements.

X is a heteroatom or a hydrocarbon group having 1-40 carbon atoms.

X' is a hydrocarbon group having 1-40 carbon atoms.

Z is



=BR₂, -AlR², -Ge-, -O-, -S-, =SO, =SO₂, -NR₂, =CO, =PR² or =P(O)R², where R² and R³ are identical or different and are each a hydrogen atom, a halogen atom, a C₁-C₂₀-alkyl group, a C₁-C₁-fluoroalkyl group, a C₁-C₁₀-alkoxy group, a C₆-C₁₄-aryl group, a C₆-C₁₀-fluoroaryl group, a C₆-C₁₀-aryloxy group, a C₂-C₁₀-alkenyl group, a C₇-C₄₀-arylalkyl group, a C₇-C₄₀-alkylaryl group, a C₈-C₄₀-arylalkenyl group and x is a number from zero to 18, or R² and R³ together with the atoms-connecting them form one or more rings and R² or/and R³ can be bonded to L and M² is silicon, germanium or tin.

30. The transition metal compound as claimed in claim 29, wherein the radicals L are

identical or different and are each an unsubstituted or substituted cyclopentadienyl group.

31. The transition metal compound as claimed in claim 29, wherein the radicals L are linked to one another via a bridge.
32. The transition metal compound as claimed in claim 29, wherein n is 2 when M is a metal atom of group IVb of the Periodic Table of the Elements.
33. The transition metal compound as claimed in claim 29, wherein
M is a metal atom of group IVb of the Periodic Table of the Elements, n is equal to 2,
L are identical or different and are each a substituted or unsubstituted cyclopentadienyl
group, where two radicals L are optionally linked to one another via a bridge Z and
Z is CR²R³ or SiR²R³ or a unit Si-(CR²R³)_x-Si which links two fragments L_nM'XX'A-R¹_m
with one another, where x is an integer from 0 to 10,
X and X' together form a three-membered to five-membered hydrocarbon chain which
can be saturated or unsaturated and are unsubstituted or substituted by one or more C₁-
C₂₀-hydrocarbon radicals.
R² and R³ are identical or different and are each a hydrogen atom, a halogen atom, a
C₁-C₂₀-alkyl group, a C₁-C₁₀-fluoralkyl group, a C₁-C₁₀-alkoxy group, a C₆-C₁₄-aryl
group, a C₆-C₁₀-fluoroaryl group, a C₆-C₁₀-aryloxy group, a C₂-C₁₀-alkenyl group, a C₇-
C₄₀-arylalkyl group, a C₇-C₄₀-alkylaryl group, a C₈-C₄₀-arylalkenyl group, or R² and R³
together with the atoms connected them form one or more rings, and R² and R³ are
optionally bonded to L.
34. The transition metal compound as claimed in claim 29, wherein
M is zirconium.

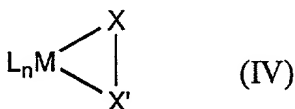
n is 2.

L are identical or different and are each a substituted cyclopentadienyl group, where two radicals L are linked to one another via a bridge Z, where Z is CR^2R^3 or SiR^2R^3 .

R^2 and R^3 are identical or different and are each a hydrogen atom, a halogen atom, a C_1 - C_{20} -alkyl group, a C_1 - C_{10} -fluoralkyl group, a C_1 - C_{10} -alkoxy group, a C_6 - C_{14} -aryl group, a C_6 - C_{10} -fluoroaryl group, a C_6 - C_{10} -aryloxy group, a C_2 - C_{10} -alkenyl group, a C_7 - C_{40} -arylalkyl group, a C_7 - C_{40} -alkylaryl group, a C_8 - C_{40} -arylalkenyl group, or R^2 and R^3 together with the atoms connected them form one or more rings, and R^2 and R^3 are optionally bonded to L.

X and X' together form an unsaturated four-membered hydrocarbon chain whose hydrogen atoms are optionally replaced by C_1 - C_{20} -alkyl groups.

35. A transition metal compound of the formula IV



wherein

L are different if n is 2, 3 or 4, and are each a π ligand or electron donor.

n is equal to 1, 2, 3, or 4.

M is a metal atom of group IIIb, IVb, Vb or VIb of the Periodic Table of the Elements.

X is a heteroatom or a hydrocarbon group having 1-40 carbon atoms.

X' is a hydrocarbon group having 1-40 carbon atoms.

36. The transition metal compound as claimed in claim 35, wherein the radicals L are different and are each an unsubstituted or substituted cyclopentadienyl group.

37. The transition metal compound as claimed in claim 35, wherein the radicals L are

linked to one another via a bridge.

38. The transition metal compound as claimed in claim 35, wherein n is 2 when M is a metal atom of group IVb of the Periodic Table of the Elements.

39. The transition metal compound as claimed in claim 35, wherein

M is a metal atom of group IVb of the Periodic Table of the Elements, n is equal to 2,

L are different and are each a substituted or unsubstituted cyclopentadienyl group, where two radicals L are optionally linked to one another via a bridge Z and

Z is CR²R³ or SiR²R³ or a unit Si-(CR²R³)_x-Si which links two fragments L_nM¹XX'A-R_m¹ with one another, where x is an integer from 0 to 10,

X and X' together form a three-membered to five-membered hydrocarbon chain which can be saturated or unsaturated and are unsubstituted or substituted by one or more C₁-C₂₀-hydrocarbon radicals,

R² and R³ are identical or different and are each a hydrogen atom, a halogen atom, a C₁-C₂₀-alkyl group, a C₁-C₁₀-fluoralkyl group, a C₁-C₁₀-alkoxy group, a C₆-C₁₄-aryl group, a C₆-C₁₀-fluoroaryl group, a C₆-C₁₀-aryloxy group, a C₂-C₁₀-alkenyl group, a C₇-C₄₀-arylalkyl group, a C₇-C₄₀-alkylaryl group, a C₈-C₄₀-arylalkenyl group, or R² and R³ together with the atoms connected them form one or more rings, and R² and R³ are optionally bonded to L.

40. The transition metal compound as claimed in claim 35, wherein

M is zirconium,

n is 2,

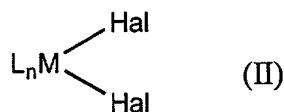
L are different and are each a substituted cyclopentadienyl group, where two radicals L are linked to one another via a bridge Z, where Z is CR²R³ or SiR²R³ and

R² and R³ are identical or different and are each a hydrogen atom, a halogen atom, a C₁-C₂₀-

alkyl group, a C₁-C₁₀-fluoralkyl group, a C₁-C₁₀-alkoxy group, a C₆-C₁₄-aryl group, a C₆-C₁₀-fluoroaryl group, a C₆-C₁₀-aryloxy group, a C₂-C₁₀-alkenyl group, a C₇-C₄₀-arylalkyl group, a C₇-C₄₀-alkylaryl group, a C₈-C₄₀-arylalkenyl group, or R² and R³ together with the atoms connected them form one or more rings, and R² and R³ are optionally bonded to L.

X and X' together form an unsaturated four-membered hydrocarbon chain whose hydrogen atoms are optionally replaced by C₁-C₂₀-alkyl groups.

41. A process for preparing the compound as claimed in claim 35, which comprises reacting a compound of the formula II



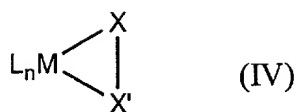
with a compound of the formula III



and reacting the reaction product with a compound of the formula AR¹_m, where L, n, M, X and X' in the formulae II and III are defined for the formula IV,

Hal is a halogen atom.

42. A transition metal compound of the formula IV



wherein

- L are identical or different and are each a π ligand or electron donor,
- n is equal to 1, 2, 3, or 4,
- M is a metal atom of group IIIb, IVb, Vb or VIb of the Periodic Table of the Elements,
- X is a heteroatom, a $\text{C}_6\text{-C}_{14}$ -aryl group, a $\text{C}_7\text{-C}_{40}$ -arylalkyl group, a $\text{C}_7\text{-C}_{40}$ -alkylaryl group or a $\text{C}_8\text{-C}_{40}$ -arylalkenyl group,
- X' is a hydrocarbon group having 1-40 carbon atoms.
43. The transition metal compound as claimed in claim 42, wherein the radicals L are different and are each an unsubstituted or substituted cyclopentadienyl group.
44. The transition metal compound as claimed in claim 42, wherein the radicals L are linked to one another via a bridge.
45. The transition metal compound as claimed in claim 42, wherein n is 2 when M is a metal atom of group IVb of the Periodic Table of the Elements.
46. The transition metal compound as claimed in claim 42, wherein
- M is a metal atom of group IVb of the Periodic Table of the Elements, n is equal to 2,
- L are different and are each a substituted or unsubstituted cyclopentadienyl group, where two radicals L are optionally linked to one another via a bridge Z and
- Z is CR^2R^3 or SiR^2R^3 or a unit $\text{Si}-(\text{CR}^2\text{R}^3)_x\text{-Si}$ which links two fragments $\text{L}_n\text{M}^t\text{XX}'\text{A-R}_m^1$ with one another, where x is an integer from 0 to 10.

X and X' together form a three-membered or five-membered hydrocarbon chain which can be saturated or unsaturated and are unsubstituted or substituted by one or more C₁-C₂₀-hydrocarbon radicals.

R² and R³ are identical or different and are each a hydrogen atom, a halogen atom, a C₁-C₂₀-alkyl group, a C₁-C₁₀-fluoralkyl group, a C₁-C₁₀-alkoxy group, a C₆-C₁₄-aryl group, a C₆-C₁₀-fluoroaryl group, a C₆-C₁₀-aryloxy group, a C₂-C₁₀-alkenyl group, a C₇-C₄₀-arylalkyl group, a C₇-C₄₀-alkylaryl group, a C₈-C₄₀-arylalkenyl group, or R² and R³ together with the atoms connected them form one or more rings, and R² and R³ are optionally bonded to L.

47. The transition metal compound as claimed in claim 42, wherein

M is zirconium.

n is 2.

L are different and are each a substituted cyclopentadienyl group, where two radicals L are linked to one another via a bridge Z, where Z is CR²R³ or SiR²R³ and

R² and R³ are identical or different and are each a hydrogen atom, a halogen atom, a C₁-C₂₀-alkyl group, a C₁-C₁₀-fluoralkyl group, a C₁-C₁₀-alkoxy group, a C₆-C₁₄-aryl group, a C₆-C₁₀-fluoroaryl group, a C₆-C₁₀-aryloxy group, a C₂-C₁₀-alkenyl group, a C₇-C₄₀-arylalkyl group, a C₇-C₄₀-alkylaryl group, a C₈-C₄₀-arylalkenyl group, or R² and R³ together with the atoms connected them form one or more rings, and R² and R³ are optionally bonded to L.

48. A compound selected from the group consisting of

Bis(methylcyclopentadienyl)ZrCH₂CHCHCH₂;

Bis(n-butyl-cyclopentadienyl)ZrCH₂CHCHCH₂;

BisindenylZrCH₂CHCHCH₂;

(tert.butylamido)dimethyl(tetramethyl- η^5 -cyclopentadienyl)sil-
lan-Zr⁺CH₂CHCHCH₂;

Bis(2-methylbenzoindenyl)ZrCH₂CHCHCH₂;

Dimethylsilandiylbis(2-methyl-indenyl)ZrCH₂CHCHCH₂;

DimethylsilandiylbisindenylZr⁺CH₂CHCHCH₂;

Dimethylsilandiylbis(2-methylbenzoindenyl)ZrCH₂CHCHCH₂;

Dimethylsilandiyl(2-methylbenzoindenyl)(2-methyl-indenyl)

ZrCH₂CHCHCH₂;

Dimethylsilandiyl(2-methylbenzoindenyl)(2-methyl-4-phenylindenyl)

ZrCH₂CHCHCH₂;

Dimethylsilandiyl(2-methylindenyl)(4-phenylindenyl)ZrCH₂CHCHCH₂;

Dimethylsilandiylbis(2-methyl-4-phenyl-indenyl)ZrCH₂CHCHCH₂;

Dimethylsilandiylbis(2-methyl-4,6-diisopropyl-indenyl)Zr⁺
CH₂CHCHCH₂;

Dimethylsilaniylbis(2-methyl-4-naphtyl-indenyl)ZrCH₂CHCHCH₂;

Isopropyliden(cyclopentadienyl)(fluorenyl)ZrCH₂CHCHCH₂;

Isopropyliden(cyclopentadienyl)(indenyl)ZrCH₂CHCHCH₂;

[4-(η^5 -Cyclopentadienyl)-4,7,7-trimethyl-(η^5 -4.5.6.7-tetrahydro-
indenyl)ZrCH₂CHCHCH₂;

Dimethylsilandiylbis(2-methyl-indenyl)ZrOCH₂CH₂CH₂;

DimethylsilandiylbisindenylZrOCH₂CH₂CH₂;

Dimethylsilandiylbis(2-methylbenzoindenyl)ZrOCH₂CH₂CH₂;

Dimethylsilandiyl(2-methylbenzoindenyl)(2-methyl-indenyl)

ZrOCH₂CH₂CH₂;

Dimethylsilandiyl(2-methylbenzoindenyl)(2-methyl-4-phenylindenyl)

ZrOCH₂CH₂CH₂;

Dimethylsilandiyl(2-methylindenyl)(4-phenylindenyl)ZrOCH₂CH₂CH₂;

Dimethylsilandiylbis(2-methyl-4-phenyl-indenyl)ZrOCH₂CH₂CH₂;

Dimethylsilandiylbis(2-methyl-4,6-diisopropyl-indenyl)

ZrOCH₂CH₂CH₂;

Dimethylsilandiylbis(2-methyl-indenyl)ZrCH₂C(CH₃)C(CH₃)CH₂;

DimethylsilandiylbisindenylZrCH₂C(CH₃)C(CH₃)CH₂;

Dimethylsilandiylbis(2-methylbenzoindenyl)Zr⁺CH₂C(CH₃)C(CH₃)CH₂;

Dimethylsilandiyl(2-methylbenzoindenyl)(2-methyl-indenyl)

ZrCH₂C(CH₃)C(CH₃)CH₂;

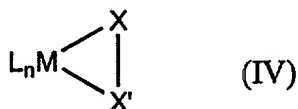
Dimethylsilandiyl(2-methylbenzoindenyl)(2-methyl-4-phenylindenyl)

ZrCH₂C(CH₃)C(CH₃)CH₂;

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Ethylenbis (2-methyl-4-naphtyl-indenyl) ZrCH₂CHCHCH₂;
Ethylenbis (2-ethyl-4-phenyl-indenyl) ZrCH₂CHCHCH₂;
Ethylenbis (2-ethyl-4,6-diisopropyl-indenyl) ZrCH₂CHCHCH₂;
Ethylenbis (2-ethyl-4-naphtyl-indenyl) ZrCH₂CHCHCH₂;
Dimethylsilandiylbis (2-ethyl-4-phenyl-indenyl) ZrCH₂CHCHCH₂;
Dimethylsilandiylbis (2,3,5-trimethylcyclopentadienyl)
ZrCH₂CHCHCH₂;
1,6-{Bis [methylsilyl-bis (2-methyl-4-phenyl-indenyl) Zr+CH₂CHCHCH₂
B⁻ (C₆F₅)₃] } hexan;
1,6-{Bis [methylsilyl-bis (2-ethyl-4-phenyl-indenyl)
Zr+CH₂CHCHCH₂B⁻ (C₆F₅)₃] } hexan;
1,6-{Bis [methylsilyl-bis (2-methyl-4-naphtyl-indenyl) Zr+CH₂CHCHCH₂
B⁻ (C₆F₅)₃] } hexan;
1,6-{Bis [methylsilyl-bis (2-methyl-4,5-benzoindenyl) Zr⁺CH₂CHCHCH₂
B⁻ (C₆F₅)₃] } hexan;
1,6-{Bis [methylsilyl- (2-methyl-4-phenyl-indenyl) (2-methyl-inde-
nyl) Zr⁺CH₂CHCHCH₂B⁻ (C₆F₅)₃] } hexan;
1,2-{Bis [methylsilyl-bis (2-methyl-4-phenyl-indenyl) Zr⁺CH₂CHCHCH₂
B⁻ (C₆F₅)₃] } ethan;
1,2-{Bis [methylsilyl-bis (2-ethyl-4-phenyl-indenyl) Zr⁺CH₂CHCHCH₂
B⁻ (C₆F₅)₃] } ethan;
1,2-{Bis [methylsilyl-bis (2-methyl-4-naphtyl-indenyl) Zr⁺CH₂CHCHCH₂
B⁻ (C₆F₅)₃] } ethan;
1,2-{Bis [methylsilyl-bis (2-methyl-4,5-benzoindenyl) Zr⁺CH₂CHCHCH₂
B⁻ (C₆F₅)₃] } ethan; and
1,2-{Bis [methylsilyl- (2-methyl-4-phenyl-indenyl) (2-methyl-inde-
nyl) Zr⁺CH₂CHCHCH₂B⁻ (C₆F₅)₃] } ethan.

49. A transition metal compound of the formula IV



wherein

- L are identical or different and are each a π ligand or electron donor.
n is equal to 1, 2, 3, or 4.
M is a metal atom of group IIIb, IVb, Vb or VIb of the Periodic Table of the Elements.
X is a heteroatom or a hydrocarbon group having 1-40 carbon atoms.

X' is a hydrocarbon group having 1-40 carbon atoms,
with the proviso that at least on L is a substituted or unsubstituted indenyl.

50. The transition metal compound as claimed in claim 49, wherein the radicals L are
linked to one another via a bridge.

51. The transition metal compound as claimed in claim 49, wherein n is 2 when M is a
metal atom of group IVb of the Periodic Table of the Elements.

52. The transition metal compound as claimed in claim 49, wherein

M is a metal atom of group IVb of the Periodic Table of the Elements, n is equal to 2,
where two radicals L are optionally linked to one another via a bridge Z and

Z is CR²R³ or SiR²R³ or a unit Si-(CR²R³)_x-Si which links two fragments L_nM'XX'A-R¹_m
with one another, where x is an integer from 0 to 10,

R² and R³ are identical or different and are each a hydrogen atom, a halogen atom, a
C₁-C₂₀-alkyl group, a C₁-C₁₀-fluoralkyl group, a C₁-C₁₀-alkoxy group, a C₆-C₁₄-aryl
group, a C₆-C₁₀-fluoroaryl group, a C₆-C₁₀-aryloxy group, a C₂-C₁₀-alkenyl group, a C₇-
C₄₀-arylalkyl group, a C₇-C₄₀-alkylaryl group, a C₈-C₄₀-arylalkenyl group, or R² and R³
together with the atoms connected them form one or more rings, and R² and R³ are
optionally bonded to L.

53. The transition metal compound as claimed in claim 49, wherein

M is zirconium,

n is 2,

where two radicals L are linked to one another via a bridge Z, wherein

Z is CR²R³ or SiR²R³ and

R² and R³ are identical or different and are each a hydrogen atom, a halogen atom, a C₁-C₂₀-
alkyl group, a C₁-C₁₀-fluoralkyl group, a C₁-C₁₀-alkoxy group, a C₆-C₁₄-aryl group, a C₆-C₁₀-

[illegible]